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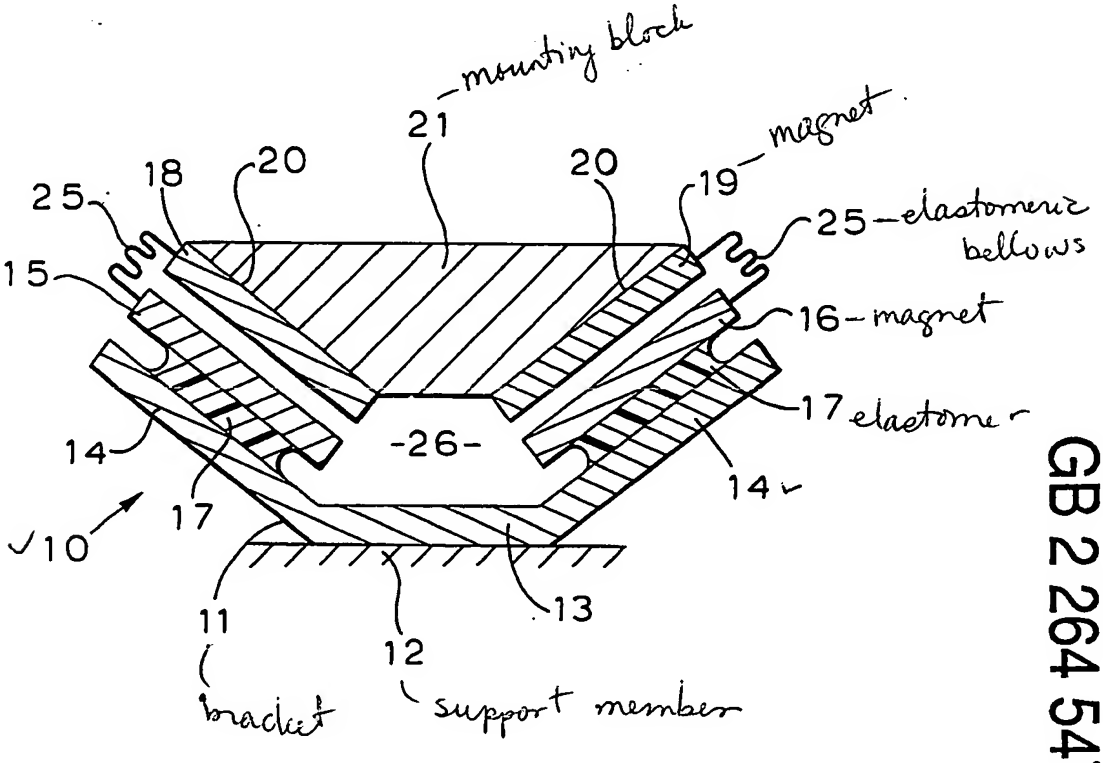
(54) Mountings

(57) A mounting 10 has two pairs of magnetic elements 15, 18; 16, 19, one magnetic element 18; 19 of each pair being adapted to be mounted with respect to a component and the other magnetic element 15; 16 of each pair being adapted to be mounted with respect to a support structure 12, each pair of magnetic elements 15, 18; 16, 19 being inclined to the horizontal at an equal but opposite angle to the other pair of magnetic elements 16, 19; 15, 18, the magnetic elements 16, 19 and 15, 18 being of the same polarity and being arranged in pairs to repel one another, a chamber 26 being formed between the opposed faces of the magnetic elements of each pair of magnetic elements 15, 18; 16, 19 and fluid being provided in the chamber 26 to damp movement of one magnetic element 18, 19 towards the other magnetic element 15, 16 of each pair.



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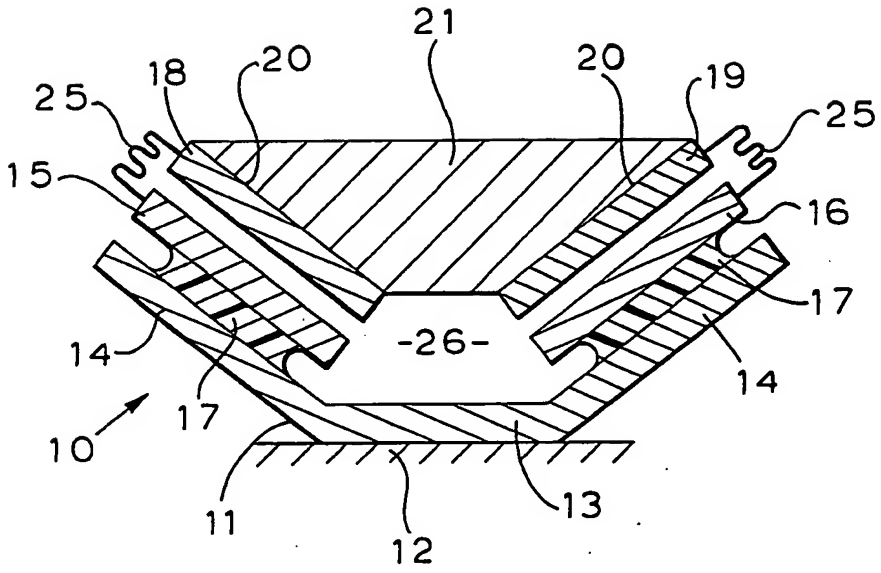
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MOUNTINGS

The present invention relates to mountings and in particular, although not exclusively, to mountings suitable for the location of the engine/gear box of a motor vehicle.

Hitherto, rubber mounting blocks have been used to locate the engine/gear box of a motor vehicle with respect to the vehicle chassis. Such mountings while producing some absorption of vibration have only been partially successful. In order to achieve better vibration damping, hydraulic mountings have been developed. These mountings are, however, only partially successful in damping high frequency vibrations. An alternative approach has been to use sprung masses in conjunction with rubber mounting blocks. While such means may be very successful in damping high frequency vibrations, they must be accurately tuned for the particular application and the resultant damping unit is of complex construction.

The present invention provides an improved mounting suitable for damping high frequency vibrations.

According to one aspect of the present invention a mounting comprises two pairs of magnetic elements, one magnetic element of each pair being adapted to be mounted

with respect to a component and the other magnetic element of each pair being adapted to be mounted with respect to a support structure, each pair of magnetic elements being inclined to the horizontal at an equal but opposite angle to the other pair of magnetic elements, the magnetic elements being of the same plurality and being arranged in pairs to repel one another, a chamber being formed between the opposed faces of the magnetic elements of each pair of magnetic elements and fluid being provided in the chamber to damp movement of one magnetic element towards the other magnetic element of each pair.

With the mounting described above, the magnetic elements repel one another so as to support the component with a gap between their opposed faces. The separation between the faces of the magnetic elements is varied by fluctuating forces applied by the component thereby isolating movement of the component from the support structure. Movement of the component is dampened by the fluid between the faces of the magnetic elements. The fluid furthermore prevents damage being caused by the magnetic elements making contact when transient high loads are applied to the component.

According to a preferred embodiment, the magnetic elements mounted to the support structure are mounted by means of elastomeric elements which will assist with

alignment of the magnetic elements and also provide some high frequency isolation, during periods of high loads when noise transmission through the fluid will be increased.

Inclination of each pair of magnetic elements at equal but opposite angles to one another, will resist movement of the components transverse to the plane of intersection of the magnetic elements. Such magnetic elements may be formed individually, or the magnetic elements mounted on the component and the magnetic elements mounted on the support structure may be formed from unitary components, for example, of part-cylindrical profile. In order to restrain the component from moving in two dimensions, the magnetic elements mounted on the component and the support structure may be formed from unitary components of part-spherical profile.

The damping fluid may be either gas or liquid depending upon the fluctuating forces to which the mounting will be subjected. The fluid may be maintained in the chamber by means of a flexible retaining bellows which closes the gaps between the magnetic elements.

An embodiment of the invention is now described, by way of example only, with reference to the accompanying drawing which illustrates diagramatically, a mounting in accordance with the present invention.

As illustrated in the drawing, a rear engine mounting 10 for a motor vehicle comprises a bracket 11 adapted to be mounted to a support member 12 of the vehicle chassis. The bracket 11 will preferably be provided with fastening means, for example studs, by which it may be bolted to the support member 12.

The bracket 11 has a base portion 13 which will abut the support member 12 when the bracket 11 is attached thereto. A pair of side portions 14 extend outwardly from opposite sides of the base portion 13 and are inclined at equal angles of say 40°, to the side of the base portion 13 opposite to that engaged by support member 12. A pair of permanent magnets 15, 16 of equal strength and the same plurality are bonded, one to each of the side portions 14 of bracket 11, by means of elastomeric layers 17.

A second pair of permanent magnets 18, 19 are mounted on inclined faces 20 of a mounting block 21, the mounting block 21 being adpated to be secured to the gear box of the vehicle, in conventional manner. The mounting block 21 is dimensioned and the faces 20 inclined so that it will locate between the side portions 14 of bracket 11, with magnets 15 and 18 and magnets 16 and 19 respectively, opposing in parallel relationship. The magnets 18 and 19 are of equal strength and the same plurality as magnets 15 and 16, so that the magnets 15

and 18 and magnets 16 and 19 will repel one another.

An elastomeric bellows unit 25 seals the gap between the bracket 11 and mounting block 21 to provide a fluid-tight chamber 26 therebetween, while permitting relative movement between bracket 11 and mounting block 21. The chamber 26 is filled with a damping fluid, preferably a low freezing point liquid, for example ethylene glycol or oil.

The repulsion between magnets 15, 18 and 16, 19 will support the engine/gear box of the vehicle and will maintain a gap between magnets 15, 18 and 16, 19. Vibrations of the engine/gear box will exert a fluctuating load on the mounting 10 which will cause the gaps between magnets 15, 18 and magnets 16, 19 to vary. The movement of the magnets 15 and 16 relative to magnets 18 and 19 is damped by the fluid in chamber 26 due to the viscosity of the fluid, as its is squeezed from between the opposed faces of magnets 15, 18 and 16, 19. This damping effect increases as the gap between the magnets 15, 18 and 16, 19 closes, thus providing a progressive damping effect and also avoiding contact between the magnets 15, 18 and 16, 19 even when the mounting 10 is subjected to high transient loads. The mounting 10 will thus absorb high frequency vibrations from the engine/gear box.

The elastomeric layers 17 also act to avoid damage in case the magnets 15, 18 and 16, 19 do come into contact with one another and will furthermore ensure that the magnets 15, 18 and 16, 19 remain parallel to one another.

The configuration of the magnets 15,18 and 16,19 does not provide any resistance to fore and aft movement or roll, resistance to such movement being afforded by engine mountings provided at the front of the engine. The magnets 15,18 and 16,19 do however provide a lateral force resisting both yaw and lateral translation and also a vertical force opposing pitch and vertical translation of the engine/gear box.

The mounting 10 described above may be provided with buffering means to prevent excessive movement of the mounting block 21 upwardly relative to bracket 11. Such buffering means may be provided by extensions of the bracket 11 which extend upwardly past the mounting block 21, the upper ends of the extensions being turned inwardly so that they overlie the mounting block 21. Elastomeric blocks are provided on the ends of these extensions so that they will engage the mounting block 21 when it reaches its upward limit of movement relative to bracket 11. This self contained form of buffer means will also act to oppose repulsion of the magnets 15, 18 and 16, 19 before the weight of the engine/gear box is applied to the mounting 10. Alternatively, the buffering

means may be independent of the mounting 10, for example acting between the gear box and transmission tunnel of a vehicle. Buffering means may also be provided to limit movement in the fore and aft and/or lateral directions.

While in the above embodiments the magnetic elements 15,16 are mounted with respect to bracket 11 by means of elastomeric elements 17, magnetic elements 18,19 may alternatively or additionally be mounted with respect to mounting blocks 21 by similar elastomeric elements.

CLAIMS

1. A mounting comprising two pairs of magnetic elements, one magnetic element of each pair being adapted to be mounted with respect to a component and the other magnetic element of each pair being adapted to be mounted with respect to a support structure, each pair of magnetic elements being inclined to the horizontal at an equal but opposite angle to the other pair of magnetic elements, the magnetic elements being of the same plurality and being arranged in pairs to repel one another, a chamber being formed between the opposed faces of the magnetic elements of each pair of magnetic elements and fluid being provided in the chamber to damp movement of one magnetic element towards the other magnetic element of each pair.

2. A mounting according to Claim 1 in which elastomeric elements are interposed between the support structure and the magnetic elements mounted with respect thereto and/or between the component and the magnetic elements mounted with respect thereto.

3. A mounting according to Claim 1 or 2 in which the magnetic elements are formed individually.

4. A mounting according to Claim 1 or 2 in which the magnetic elements associated with the component and the

magnetic elements associated with the support structure are each formed by unitary magnetic components.

5. A mounting according to Claim 4 in which the magnetic components are each of part-cylindrical profile.

6. A mounting according to Claim 4 in which the magnetic components are each of part-spherical profile.

7. A mounting according to any one of the preceding claims in which the gaps between the magnetic elements are closed by a flexible bellows unit to form a fluid-tight chamber.

8. A mounting according to any one of the preceding claims in which the damping fluid is a liquid or gas.

9. A mounting according to Claim 8 in which the damping fluid is a low freezing point liquid.

10. A mounting according to Claim 9 in which the damping fluid is ethylene glycol or oil.

11. A mounting according to any one of the preceding claims in which buffer means is provided to limit movement of the magnetic elements associated with the component relative to the magnetic elements associated with the support structure, in fore and aft, upward

and/or lateral directions.

12. A mounting substantially as described herein with reference to, and as shown in, the accompanying drawing.

Amendments to the claims have been filed as follows :

CLAIMS

1. A mounting comprising two pairs of magnetic elements, one magnetic element of each pair being adapted to be mounted with respect to a component and the other magnetic element of each pair being adapted to be mounted with respect to a support structure, each pair of magnetic elements being inclined to the horizontal at an equal but opposite angle to the other pair of magnetic elements, the magnetic elements being of the same polarity and being arranged in pairs to repel one another, a chamber being formed between the opposed faces of the magnetic elements of each pair of magnetic elements and fluid being provided in the chamber to damp movement of one magnetic element towards the other magnetic element of each pair.

Patents Act 1977
Examiner's report to the Comptroller under Section 17 (The Search Report)

Application number

9204415.5

Relevant Technical fields

(i) UK Cl (Edition K) F2S (SAA SCL)

(ii) Int Cl (Edition 5) F16F

Search Examiner

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Databases (see over)

(i) UK Patent Office

(ii)

Date of Search

26 MARCH 1992

Documents considered relevant following a search in respect of claims 1-12

Category (see over)	Identity of document and relevant passages	Relevant to claim(s)
	NONE	

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Category	Identity of document and relevant passages	Relevant to claim(s)

Categories of documents

X: Document indicating lack of novelty or of inventive step.

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